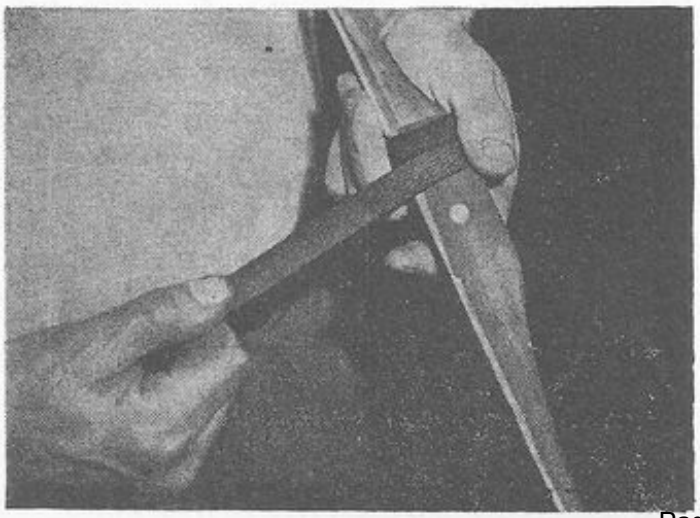
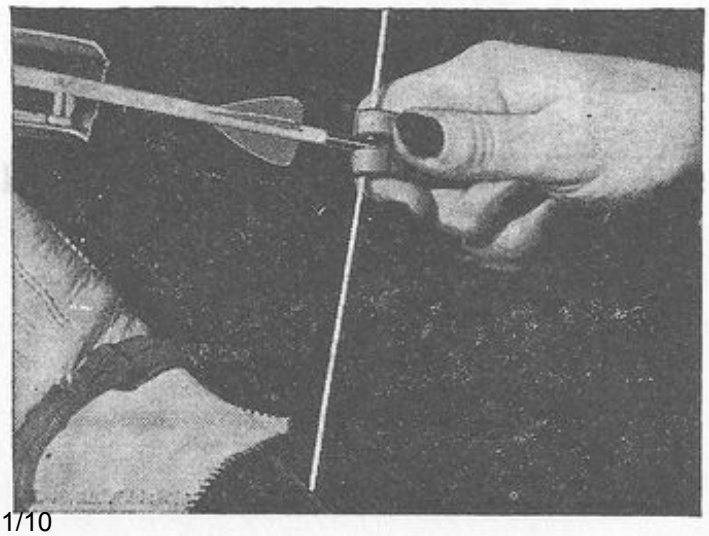
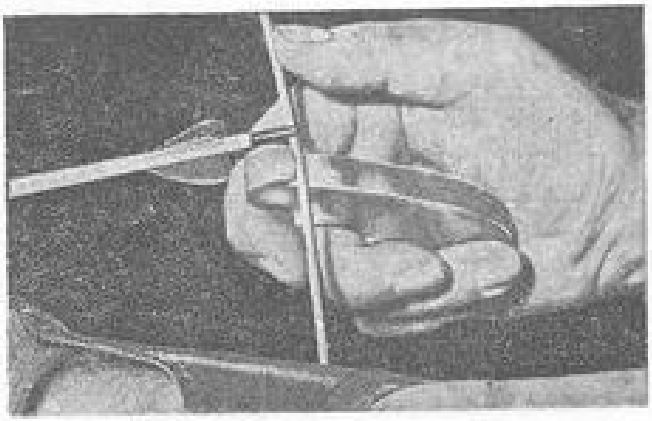
WOULDN'T YOU like to own a bow that will drive an arrow the length of five football fields? Then, according to expert bowmen R. A. Branaka and Clarence Haugen, you should take up flight archery. One of the first flight bows made by Mr. Branaka won a divisional national championship for Mrs. Branaka with a record shot of 395 yards. Mr. Haugen holds the divisional men's national title with a record shot of 547 yards.

Flight bows differ greatly from

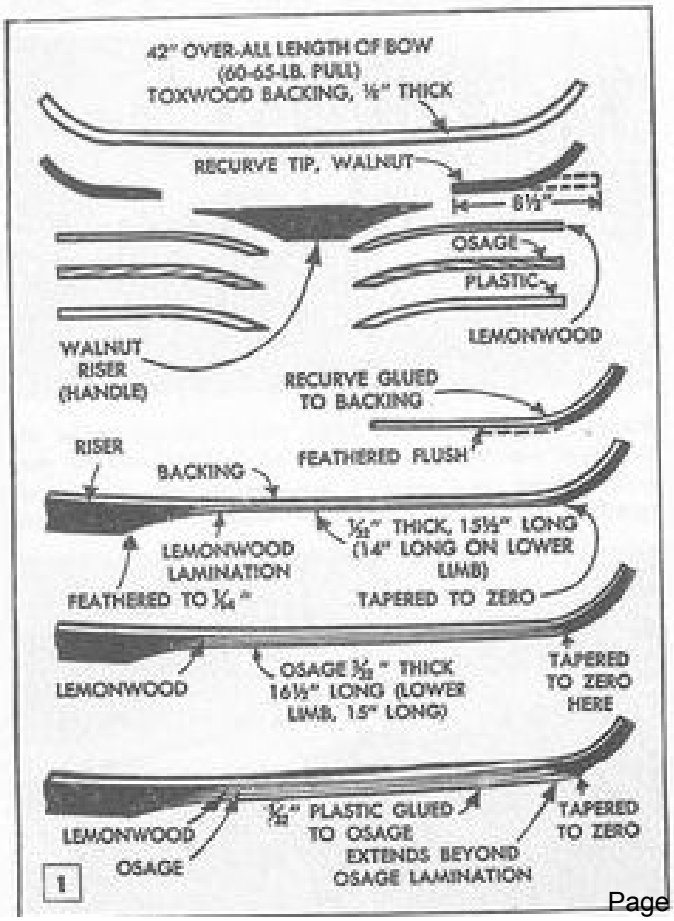
Lower left, wrapping riser with calfskin to form a secure handgrip. Lower right, some archers use a leather "flipper" to release the arrow







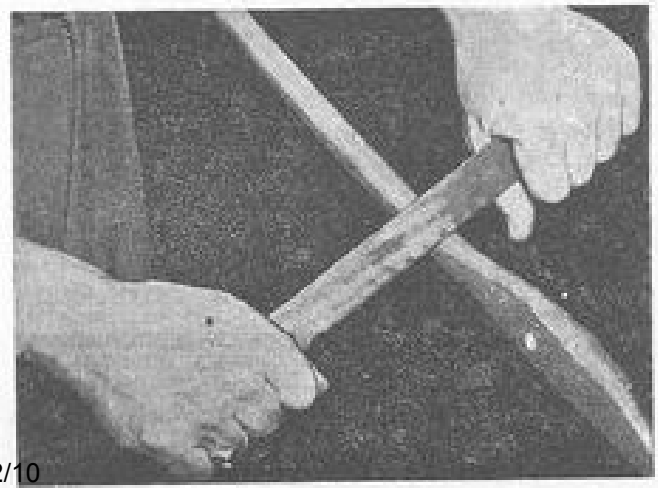
The hook-type release is used by many flight archers

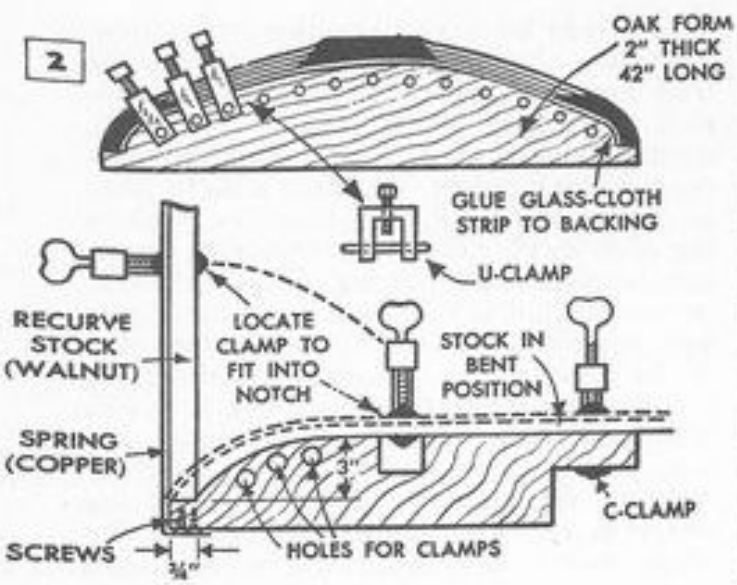


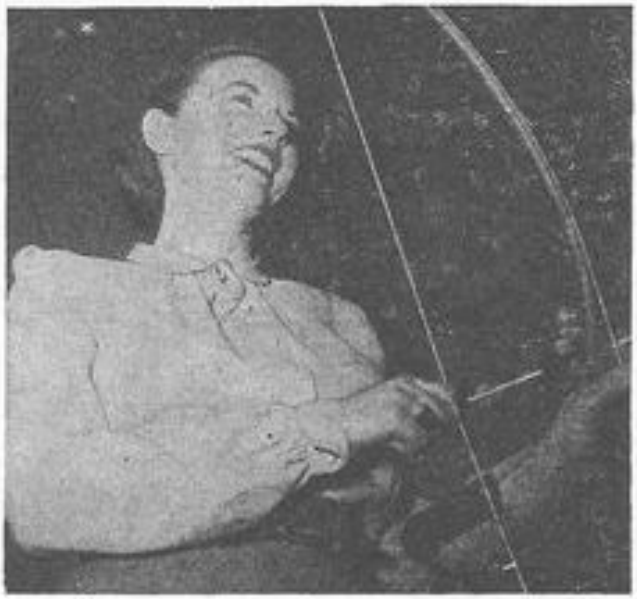
those made for target practice or hunting. They are short and sturdy, and because they are made of special laminated materials including several kinds of tough, springy woods, flight bows have tremendous driving power. Building a flight bow, as in Figs. 1, 2 and 3, is a procedure employing such hand operations as rasping, scraping, sanding and polishing a single piece to several sectional sizes. For this reason it is not possible to detail and describe each step of the process. The first step is to build the two bending forms detailed in Fig. 2, as you will need these as soon as you begin construction of the bow. One form is used for bending the recurve tips, Fig. 1, and the other is specially made for applying the glass-cloth (Conlon) strip to the backing as in the upper detail, Fig. 2. Special clamps are made for use with this form by bending ⅜ x 1-in. flat steel to a U-shape and drilling 5/16-in. holes near the ends for a ¼-in. pin which is inserted through a hole drilled in the form. The web of the clamp is drilled and tapped for a cap screw. This type of clamp makes it necessary to protect the bow with a strip of sheet metal to prevent damage from the end of the screw as it is turned down. The large form is 42 in. long, which is the finished length of the bow, and the curved ends are cut on a 3½-in. radius.

Bowmakers usually begin construction by making the riser (handle) and the recurve tips. The latter must be steamed for at least 30 minutes before they can be bent over the form. The walnut stock is ⅜ in. thick and 1 in. wide. The tips are cut to 14-in. lengths before bending. The riser, Fig. 3, is cut with a 10-in. radius at each end. It should be noted that in the assembly of the laminations the riser is slightly off-center. Note also that the bow has two parts, the upper half being referred to as the upper limb and the lower half as the lower limb. After the riser has been sawed to the rough

Flight bow being roughed with special scraper made from power-hacksaw blade. Operation is known to archers as tillering. Wood rasps may also be used





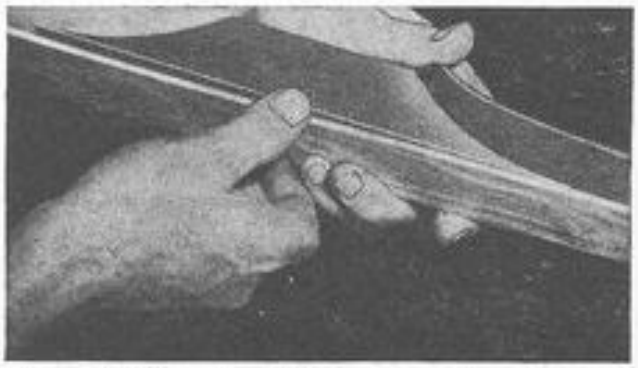


Arrows used in flight archery are made by professional arrow makers because they must be accurate

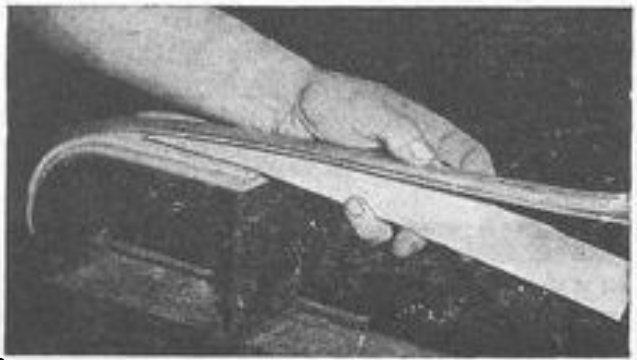
form and the curved surfaces smoothed by sanding, it is glued to the center of the toxwood backing strip. (Toxwood consists of thin layers of selected maple bonded with a special resin adhesive.) Before the glue dries, wipe off all the excess so that a smooth joint results. Next, the walnut recurve tips are steamed and bent. After drying thoroughly in the forms, they are removed and cut to 8½-in. over-all length and glued to the toxwood backing. The lower ends of the tips are feathered flush before the lemonwood laminations are applied. Note that these are 14 and 15½ in. long, Fig. 1. At the riser ends, the lemonwood laminations are tapered to 1/64 in., but are feathered or tapered to zero at the outer ends where they join the recurves. Apply the Osage laminations in the same manner, but note before cutting stock that one is 15 and the other 16½ in. long. Locate the center of the bow and measure 4½ in. each way. Then bandsaw the riser to the form shown by the dotted lines in Fig. 3. The recurve tips are tapered by hand, the dotted lines serving merely as guides to the rough size. At this stage the bow is ready for nocking and rough shaping, or tillering.

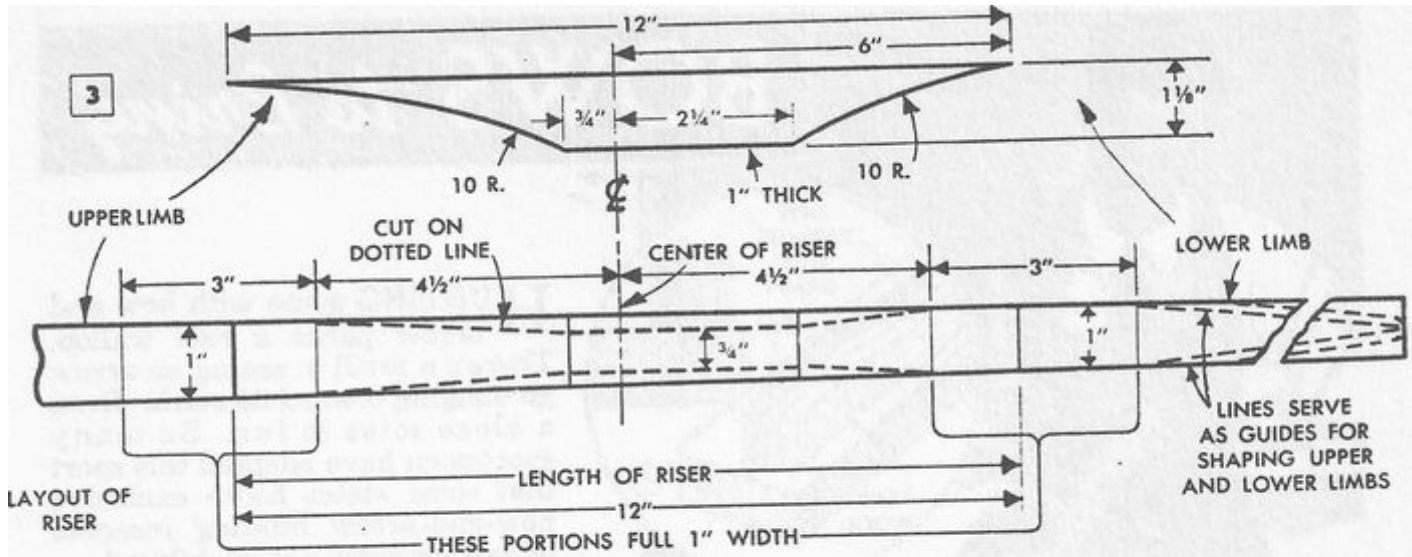
Riser is first glued to toxwood strip, which consists of resin-bonded layers of maple selected for grain

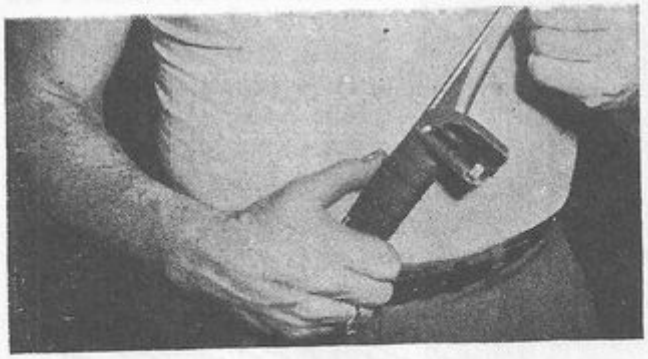
The recurve tips are nocked for the bowstring as in the center photo on the opposite page. Use a 3/16-in. round file and file the notch at approximately the angle indicated. The notch should continue around to the opposite side of the tip. Be sure that it is cut to the same depth and at the same angle on both sides of the tip. Brace (string) the bow with a linen bowstring. Then hold it firmly in a padded vise and scrape the limbs to bring the bow to the proper tiller, or bend. This is one of those jobs that must be done by stages with frequent periods of testing with a spring scale. Bowmakers usually use a fish scale for testing. Scraping can be done with a cabinet scraper with fair

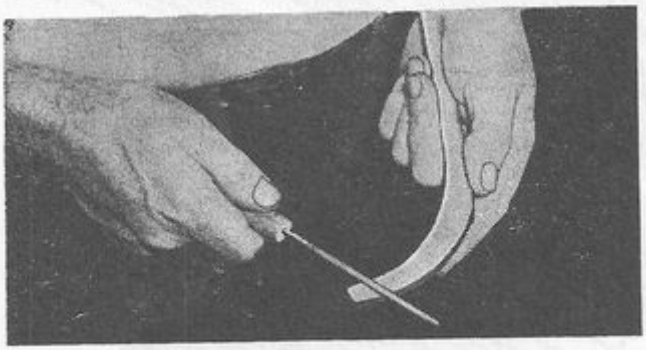


Above, the lemonwood lamination follows curve of the riser and is tapered to 1/64-in. thickness at the end. Below, professional bowmakers use a special bending jig of this type for bending recurve tips









Upper photo, one of several types of plastic overdraw attachments. Center, cutting nocks (notches) in the recurve tips of a flight bow. Below, bowmakers finish the bow by dipping in tank containing varnish

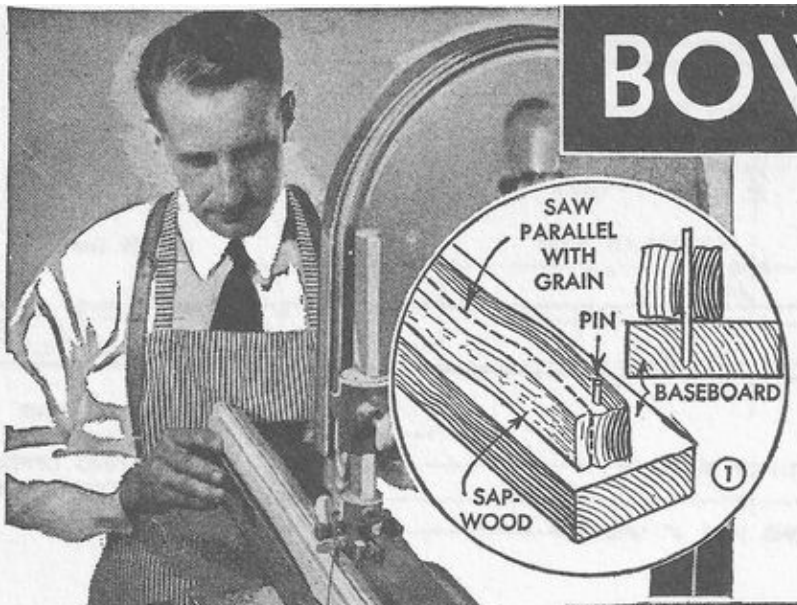
success but bowmakers prefer a discarded power-hacksaw blade having one side ground to a cutting edge. As the scraping proceeds, check the pull with the spring scale, drawing the bowstring 24 in. from the center of the bow at each trial check. As each check is made, note carefully the arc of each limb of the bow. Both should flex to the same arc during the test. If not, scrape excess stock from the stiffer one until both flex uniformly when the bow is braced.

When tillering and scale checks bring the pull to about half the desired weight of 60 to 65 lbs., the bow is ready for application of the plastic, which is glued and clamped in place in the same manner as the other laminations. Application of the plastic will increase the pull somewhat beyond the 60 to 65-lb. limit and it will be necessary to continue the scrape-and-weight-check procedure until the desired pull is restored.

The final step in building up the laminations is the application of a Conlon (glass cloth) strip to the toxwood backing. A length of glass cloth slightly longer than the bow is placed over the large bending form. Coat the toxwood backing with glue and place the bow on the form over the glass-cloth strip. Then apply U-clamps and allow to dry thoroughly. Once more it will be necessary to scrape the bow to restore the proper pull. Work carefully and check frequently this time or you may exceed the limit. When the pull has been correctly established, sand the bow to a glass-smooth surface and apply two thin coats of varnish.

Now, how about the proper technique of flight-bow archery? You'll have to use the trial-and-error method to discover that. But to get yourself started on the right foot, it would be advisable to contact your local archery club for some pointers. Then keep practicing until you attain a smooth, one-operation maneuver.

BOWS to Bring



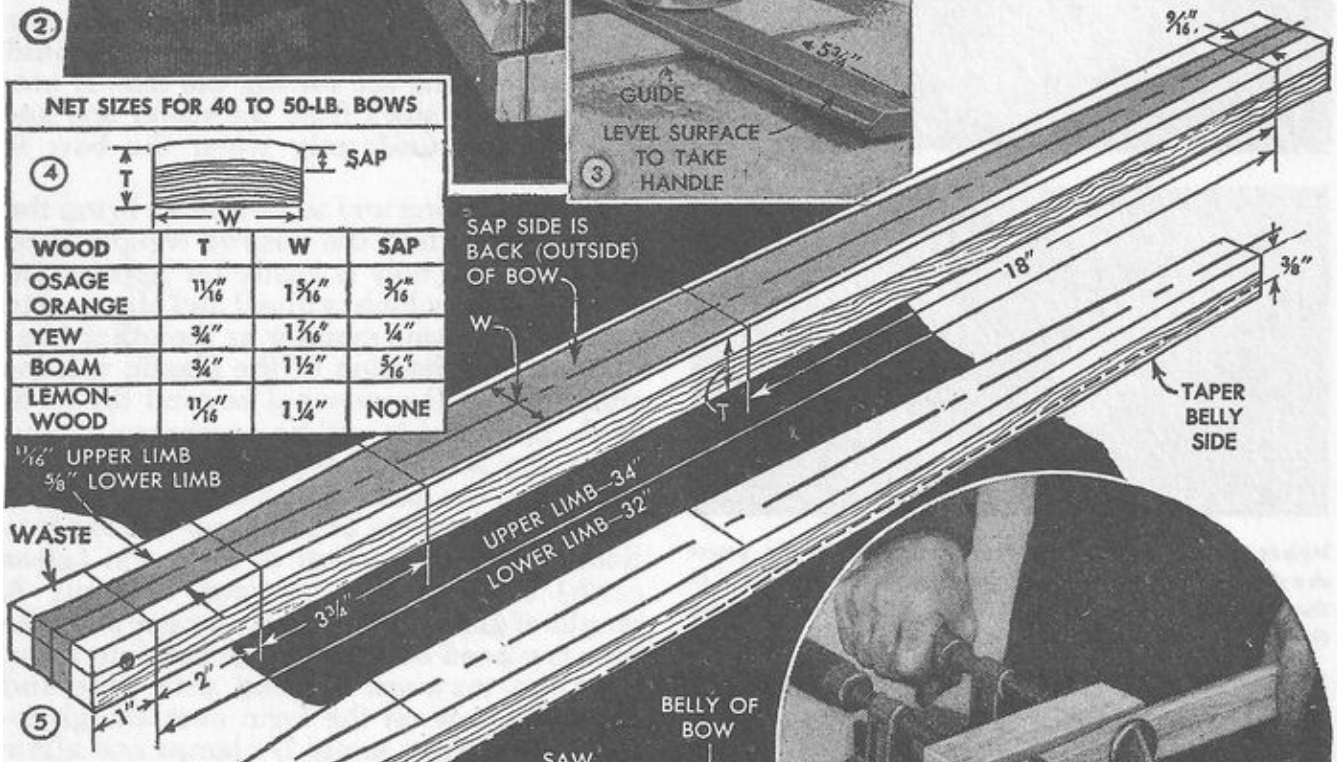
HUNTING game with bow and arrow packs a real wallop. There's a thrill in seeing an arrow go winging toward its mark. Even a close miss is fun. So many sportsmen have adopted this sport that some states have exclusive bow-and-arrow hunting reserves where firearms are prohibited.

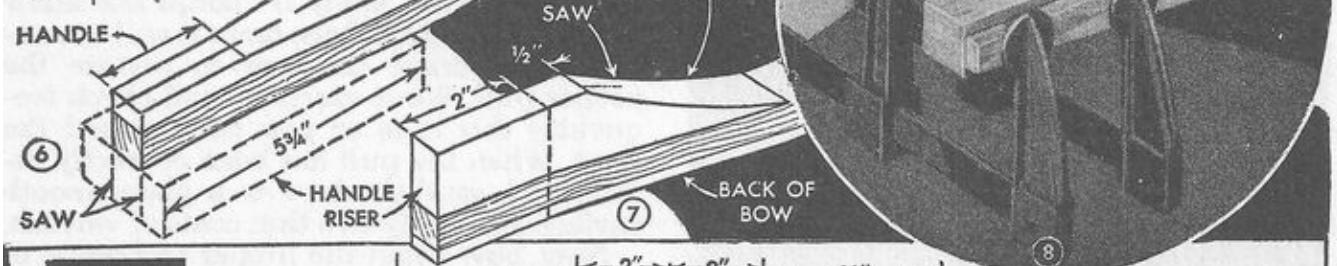
A bow for hunting should be as short as practical, ranging in length from 4 ft. 8 in. to 5 ft. 6 in. It should be a plain bow, able to stand a lot of knocking around.

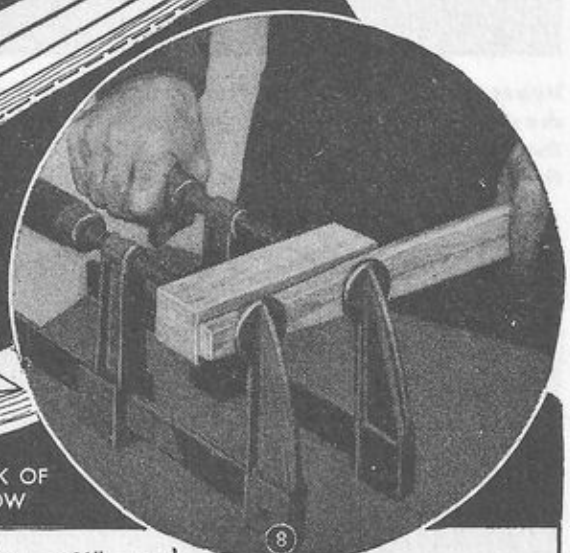
NET SIZES FOR 40 TO 50-LB. BOWS

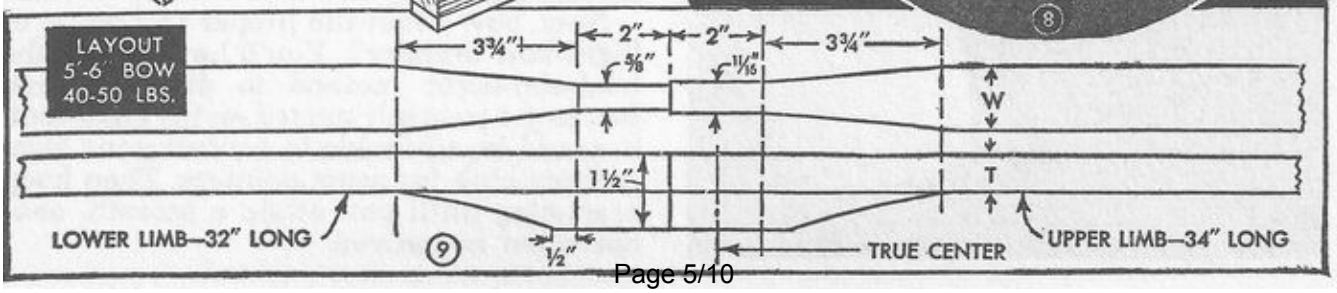
4

WOOD	T	W	SAP
OSAGE ORANGE	11/16"	1 5/16"	3/16"
YEW	3/4"	1 7/16"	1/4"
BOAM	3/4"	1 1/2"	5/16"
LEMON-WOOD	11/16"	1 1/4"	NONE

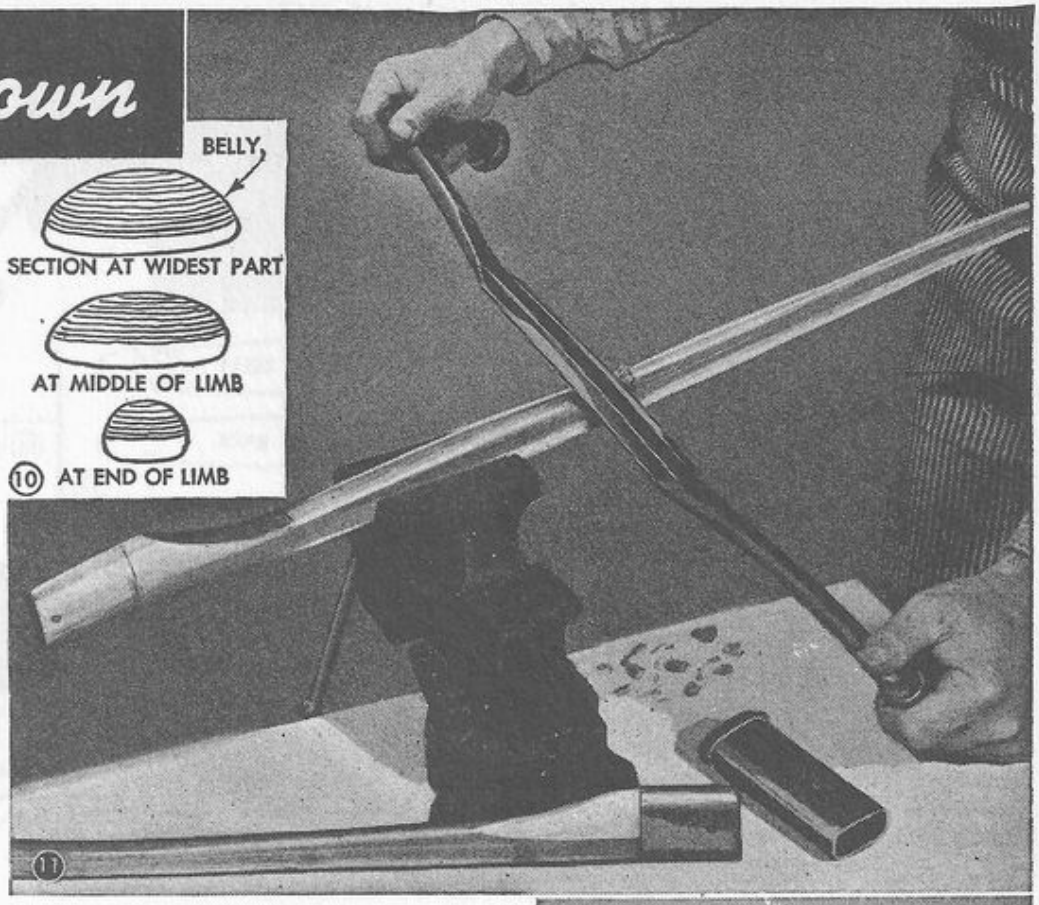






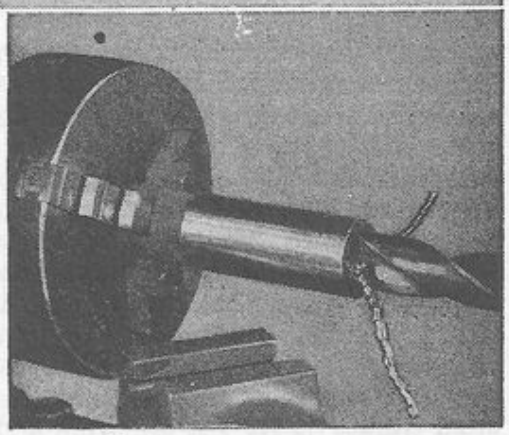


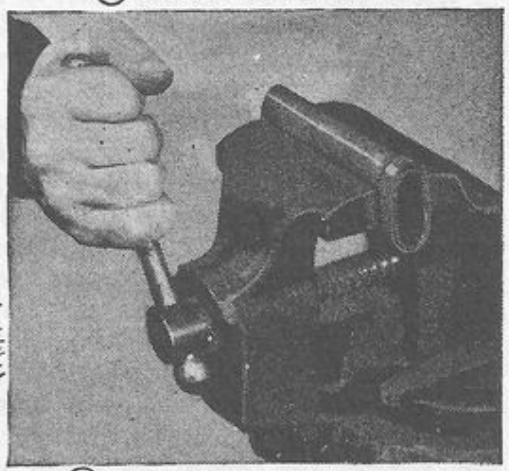
'em Down

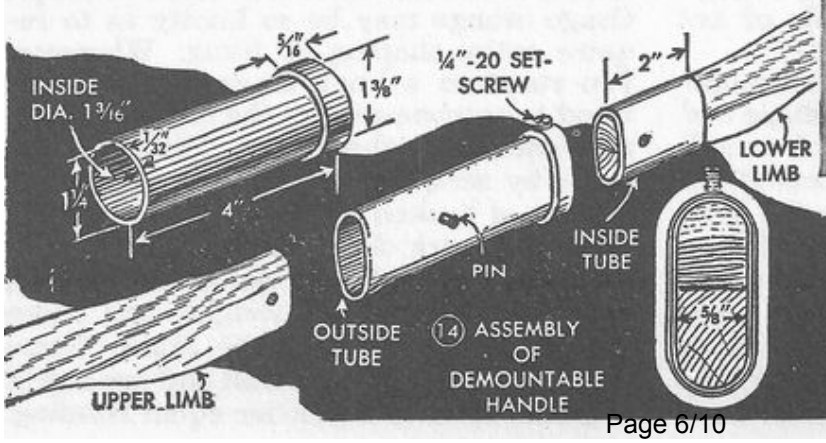


The drawing weight need not be excessive; you can bring down the toughest game in the country, including moose, bear and wild boar, with a 45 to 50-lb. bow and a steel broadhead arrow. Most hunters prefer a flat or semiflat bow. The demountable type of semiflat bow described here is popular because of ease of transportation, and the knockdown handle in no way affects smooth, fast shooting. If this is your first bow, by all means make it of lemonwood, as this compact and nearly grainless wood permits mechanical shaping without any regard to grain structure. If you want the best, however, use osage orange or boam. Yew is good, too, although a little too soft for rough usage. All bow woods except lemonwood require careful following of the grain.

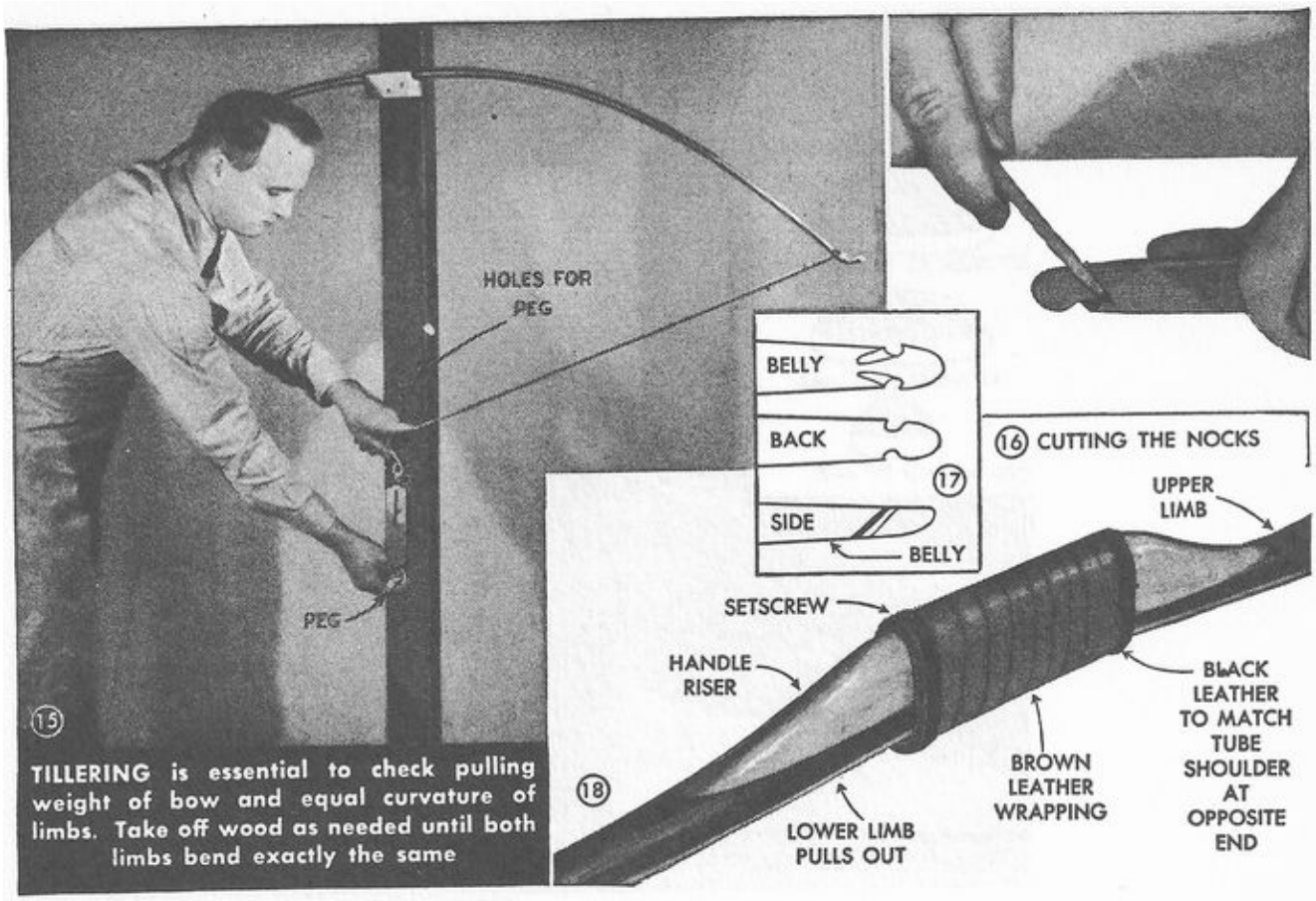
Start by roughing out the back of the bow. Osage orange is perfect in this respect; just peel off the bark, and the remaining layer of sapwood, about 3/16 in. thick, is just right. Yew and boam have more sapwood and will require trimming down. This can be done best on a band saw as in Figs. 1 and 2, mounting the stave on a guide board and then saw-


12 BORING THE HANDLE TUBE


13 VISE PRESSURE GIVES OVAL SHAPE



THE HUNTING BOW should be as short as practical, with pulling weight of 40-60 lbs. Style shown is semi-flat, with demountable handle for ease in transportation



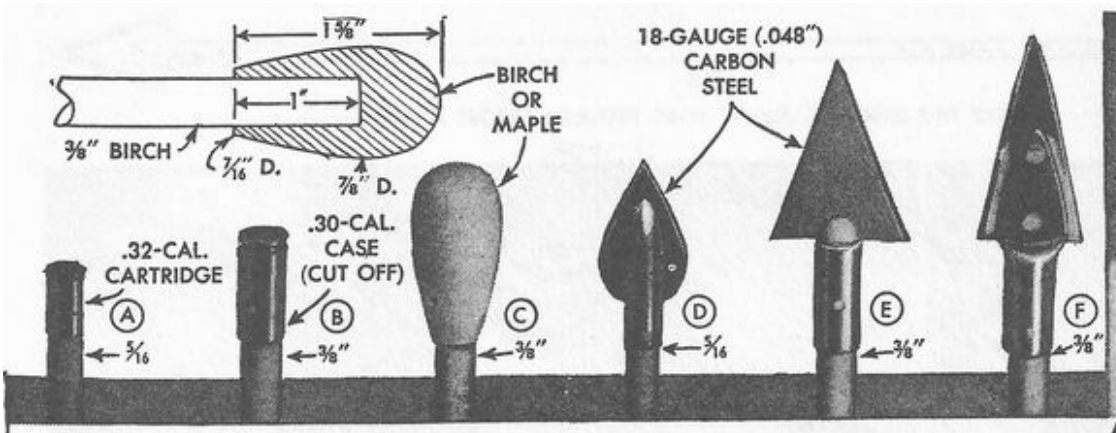
ing on a line the required distance away from the heartwood. Pins holding the stave should be a snug drive fit in holes drilled squarely across the chord of the grain, as indicated in Fig. 1. If there is too much heartwood, it can be trimmed down with the same setup. Where there is just a little extra wood on the heart side, a planer head in the drill press will remove it in a jiffy, Fig. 3. In the absence of power tools, the staves can be trimmed with a drawknife. The first stage of cutting gives you a flat stick about ¾ by 1½ in. with a thin layer of white sapwood on the back as shown in Fig. 5. Here you can see why it is easy to work with lemonwood; you have no sapwood to worry about, and the compact grain permits ripping and jointing to straight lines. All the other woods will be crooked, the back of the bow following every dip and curve in the grain. After band-sawing, smooth up the back of the bow with drawknife and scraper, following the grain. Fig. 4 shows table of net sizes for bows of different woods.

On the back of the stave, draw the outline shown in Fig. 5, band-saw to shape and taper the belly side as in Fig. 6. You will cut across the grain to some extent in both operations, but it is only on the back of bow that you positively must follow the grain. Glue the handle riser in place, Fig. 8, and then band-saw it both ways to the shape shown in Fig. 7. Both limbs of the bow are treated in the same way except that the upper limb should be 2 in. longer than the lower one, as in Fig. 9.

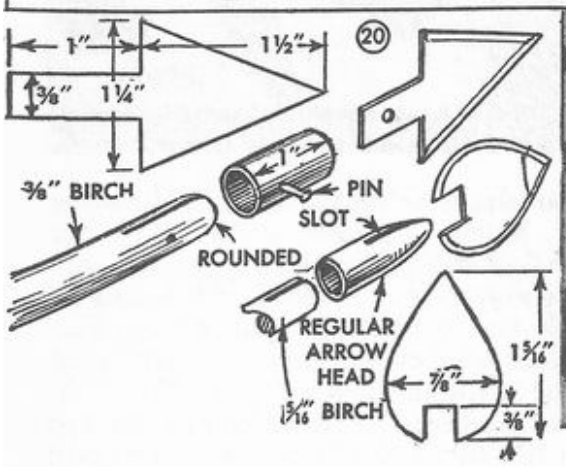
The demountable feature is accomplished by fitting the limbs of the bow inside a metal tube. You can buy telescoping tubes for this purpose, or you can make your own. Fig. 14 shows the general nature of the assembly. The short inside tube is pinned to the lower limb and the long outer tube is pinned solidly to the upper limb, the lower limb being a slide fit inside the outer tube, where it is held rigidly by means of a setscrew. Making your own telescoping tube is just a matter of turning and boring, Fig. 12, and then squeezing the assembled tubes in a vise as in Fig. 13, to get the required oval section. It is advisable to heat the work, otherwise the steel may crack at the shoulder portion. The original fit of the round tubes should not be too snug.

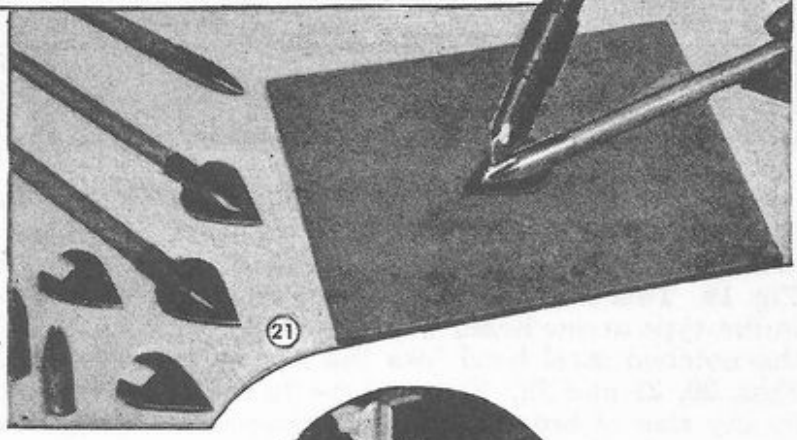
Figs. 10 and 11 show the final stage of shaping the bow, rounding off the belly with a drawknife or coarse and fine rasps. Osage orange may be so knotty as to require entire shaping by filing. Whenever you run into a knot, leave a little extra wood to compensate for the natural weakness caused by the defect. Finish off the limbs by scraping with a hook scraper or a piece of broken glass.

As you work down the belly side, tiller the bow frequently as shown in Fig. 15, checking its drawing weight, and more important, the bend of the limbs. Some workers tiller against a wall and use a grid of pencil lines to check for equal bending.

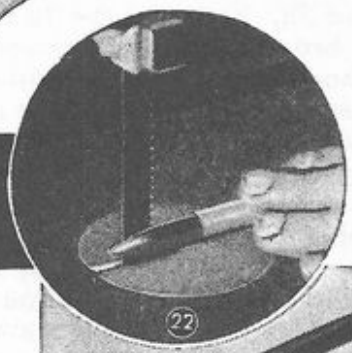


(19) VARIOUS STYLES OF BLUNT AND BROADHEAD HUNTING ARROWS





HUNTING ARROWS in blunt and broadhead styles are shown on this page. Steel for heads can be obtained from old power-hacksaw blades

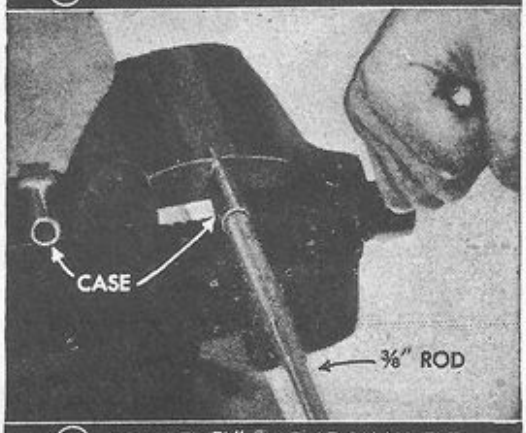


However, good results can be obtained by eye inspection alone, and by noting if the string tends to pull off to one side as you pull it back. The bow should be rigid through the handle, and almost rigid the full length of the handle riser. Starting at the end of the handle riser, the limbs should bend in a graceful arc. Go slow at this stage; it is very easy to remove too much wood and ruin the bow. If you get a little under the poundage you want, cut an inch off both limbs and try it again. Get the pull about 5 lbs. more than you want; it will let down about that much after you have used it a few hours. If the bow is much too heavy throughout, make a fast dip immediately beyond the handle riser to get a thinner section, and then taper gradually to the tips. Nocks should be of the plain type cut into the wood as in Figs. 16 and 17. Fig. 18 shows the finished bow at the handle.

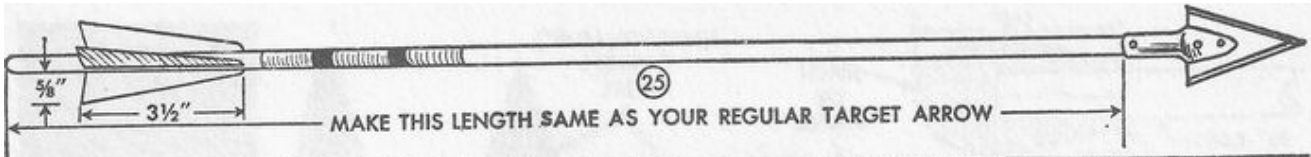
There are two kinds of hunting arrows: blunts and broadheads. The blunt points, details A, B and C of Fig. 19, can be made from cartridge cases or turned from wood. These heads have tremendous hitting power. They will bowl over a rabbit or knock a squirrel out of a tree. The need for the blunt point is obvious; you can imagine what happens to a sharp steel broadhead when you wham it into a tree trunk, or worse, a high tree limb.

Steel broadheads are needed for both small and big game. With sharp-cutting edges, even a 40-lb.

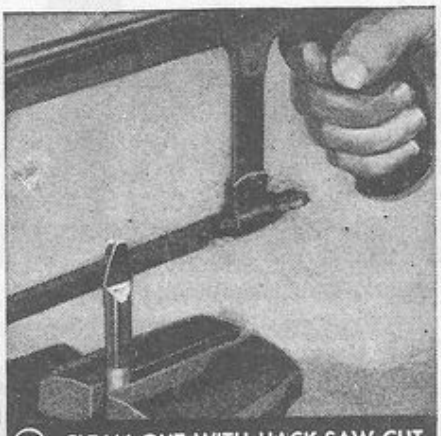
(23) CUT SLEEVES FROM .30-CAL. CASES



(24) SQUEEZE ⅞" FLAT AT SMALL END



26 GRIND FLATTENED END TO SHAPE


27 CLEAN OUT WITH HACK-SAW CUT

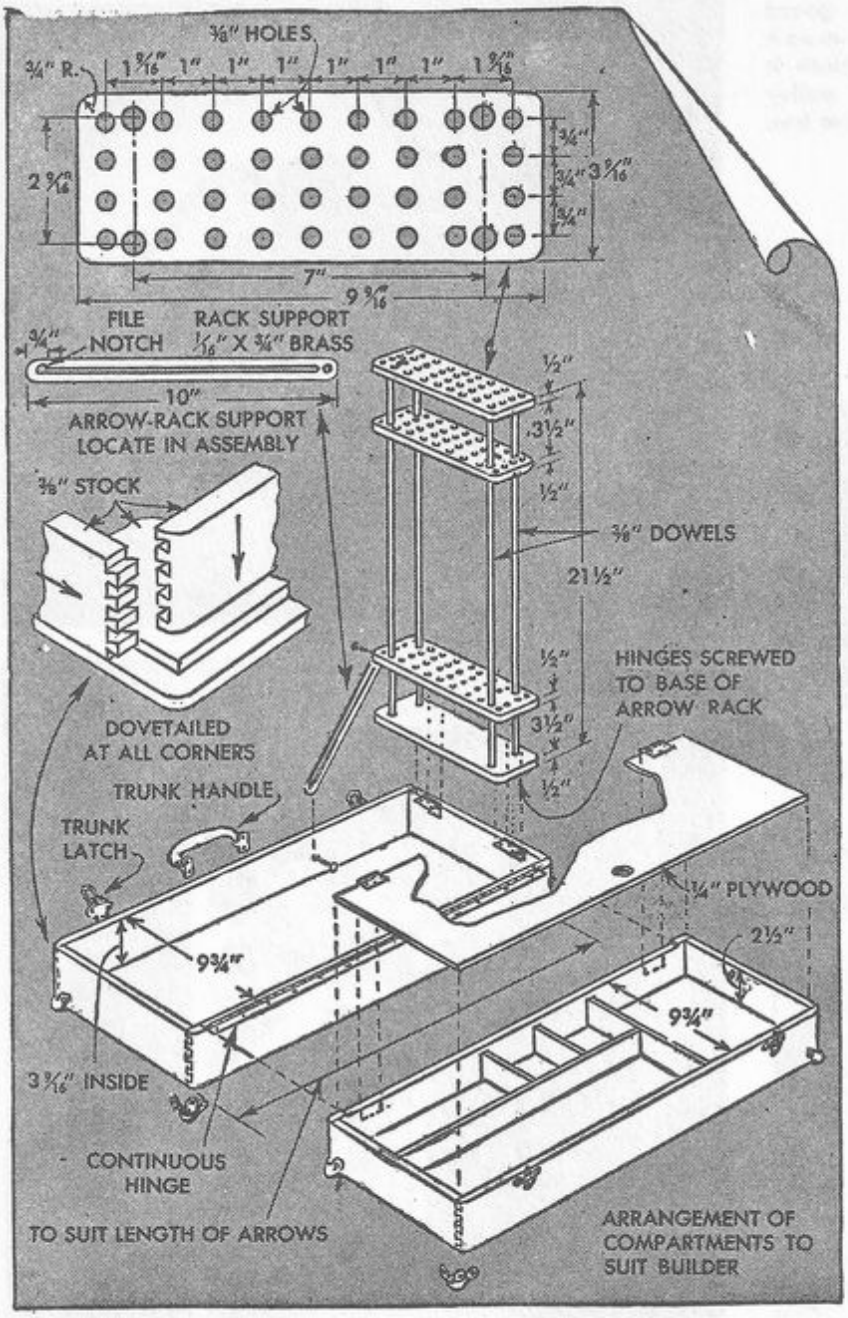
28 RIVET THE STEEL HEAD IN PLACE

bow will send one of these shafts right through a two-point buck. The smallest practical head is the lancet shown at D, Fig. 19. This is made by slotting a regular bullet-type arrow head, and then soldering the notched steel head into the slot as in Figs. 20, 21 and 22. Easiest type to make in any size of broadhead is the tang-and-sleeve style shown at E and explained in Fig. 20. The step-by-step operation in making a broadhead, style F, is shown in Figs. 23 to 28. If you use .30-cal. ball cartridge cases, it will be necessary to have a tang on the broadhead for needed strength. With a sleeve of thicker copper or steel tubing, the split ends of tube alone will hold the head, which can be made a simple, triangular shape without tang. Old power hacksaw blades furnish good steel for heads. All of the styles shown can be purchased readymade if desired. Fletching of shafts follows standard practice except that the feathers are preferably of the low, long triangular style as shown in Fig. 25. Complete construction kits including heads, cut feathers and birch shafts can be purchased at a nominal cost and provide an ideal method of working. The diameter of shafts will depend somewhat on the pull of your bow. If the pull is 40 lbs. or under, 5/16 or 11/32-in. shafts are plenty heavy. Bows pulling over 45 lbs., especially when big broadheads are used, must have 3/8-in. shafts to stand up under the terrific impact.

ARCHERY KITS

Compact and easy to carry, this archery tackle box has space for almost everything that's needed in the field. Compartments can be arranged to suit your convenience

IF THE over-all dimensions shown on the drawing are followed, one half of this archery tackle box will have space enough for 36 arrows and the other half can be



divided into compartments to carry such necessities as arm guards, gloves, string wax, repair thread and other items that are a part of every archer's kit. The corners are dovetailed and the two sidepieces are rabbeted for a close fit. Arrangement of the compartments is made to suit your own requirements. The dividing section fits into the half that contains the compartments and has a finger hole reinforced with a metal grommet. Construction of the rack for the arrows is shown in the upper and right-center details. Notice that the metal arrow-rack support is fitted after the rack is completed and hinged to the box. After the two halves of the box are joined with a continuous or piano-type hinge, all corners are rounded and fitted with metal reinforcements. The handle and latches are of the type used for trunks.

ARCHERY TARGET

There will be no possibility of a strong wind blowing your archery target off its tripod and possibly breaking expensive arrows if you attach it to the tripod as shown. Two strong rubber bands cut from an old inner tube are fastened together to make one long band and then fitted with hooks. The band is run through a hole in one leg of the tripod and is hooked into the target as indicated. When not in use, the band is hooked into the hole in the tripod leg to prevent losing it.